

COURSE SYLLABUS

BIOMATERIAL-BASED PRODUCT DEVELOPMENT LABORATORY 3091662

COURSE DETAILS

Campus:	Ashdod	Type of Course:	Required
Department:	Chemical Engineering	Level of Course:	First degree
Discipline:		Mode of Delivery:	Face-to-face, Project oriented (PO)
Year of Study:	Forth	Prerequisites:	Biopolymer engineering 3030112
Semester:	Spring	Co-Requisites:	
Credit:	3	Language of Instruction:	Hebrew
ECTS Credit Points:	4.5	Work Placement(s):	Laboratory
Lecturer(s):	Dr. Kfir Ben-Harush		
Teaching Assistant(s):	Mr. Lotan Jackson		
Lecturer(s) Email:	kfirb@sce.ac.il		

AIM

The purpose of this laboratory course is to teach the student to produce and characterize biomaterials based on proteins expressed in bacteria. whilst doing so, get to know the typical laboratory tools and equipment in the various manufacturing and characterization stages.

LEARNING OUTCOMES

Upon successful completion of the course, students will be able to:

1. Use the various equipment and laboratory instruments.
2. Perform a fermentation process of bacteria that express protein.
3. Perform processes for the production of proteins and their purification from bacteria.
4. Produce 3 types of biomaterials from proteins and polysaccharides.
5. Mechanically characterize biomaterials.
6. Use a 3D biological printer.
7. Write a lab protocol that includes all work steps from scientific literature.
8. Write a concluding technical report.

COURSE CONTENTS

Week	Subject	Relevant Reading
1	Laboratory safety lecture	
2	Expression of fibrous protein in bacteria using a bioreactor - analysis of a protocol from a scientific paper - preparatory lab	[1]
3	Expression of fibrous protein in bacteria using a bioreactor - practical execution	
4	Purification of fibrous protein from bacteria - analysis of a protocol from a scientific paper - preparatory lab	[1]
5	Purification of fibrous protein from bacteria - practical execution	
6	Preparation of fibers and films based on protein and polysaccharides - analysis of a protocol from a scientific paper - preparatory lab	[2]
7	Preparation of fibers and films based on protein and polysaccharides - practical execution	
8	Tensile tests of fibers and films, and three-dimensional printing of alginate solutions - analysis of a protocol from a scientific paper - preparatory lab	[3], [4]

- | | |
|----|--|
| 9 | Tensile tests of fibers and sheets, and three-dimensional printing of alginate solutions - practical execution |
| 10 | Engineering challenge - presenting a work plan |
| 11 | Engineering challenge - preparing the biomaterial |
| 12 | Engineering challenge - characterization of biomaterial |
| 13 | Concluding meeting |

RECOMMENDED OR REQUIRED READING

Text book:

1. Gerd Gellissen, Production of Recombinant Proteins: Novel Microbial and Eukaryotic Expression Systems, 2005, Wiley-VCH

Other readings:

2. Sabu Thomas, Dominique Durand, Christophe Chassenieux, P. Jyotishkumar, Handbook of Biopolymer- Based Materials: From Blends and Composites to Gels and Complex Networks, 2013, Wiley-VCH
3. Jorg Mussig, Industrial Applications of Natural Fibres: Structure, Properties and Technical Applications, 2010, Wiley-VCH
4. Malgorzata K. Wlodarczyk-Biegun, Aranzazu del Campo, 3D bioprinting of structural proteins, biomaterials, 2017

PLANNED LEARNING ACTIVITIES AND TEACHING METHODS

Weekly laboratory hours: 6. The work within the laboratory will be carried out independently. Participation in the lab requires preparation for the lab and performing a lab test. At the end of all the experiments, including the engineering challenge, a report will be submitted summarizing all experiments. This report will include

an extensive theoretical introduction to all the experiments, a description of the methods, a description of the results and a concluding discussion.

ASSESSMENT METHODS AND CRITERIA

Quizzes:	25%	Grade of 56 in the exam is the minimum required in order to participate in laboratory activities. Non-participation in the lab will result in a score of 0 in the same lab.
Laboratory:	25%	Evaluation of the work in the laboratory
Reports:	50%	Concluding report
Participation:		Attendance is mandatory at all labs.